

FIG. 1

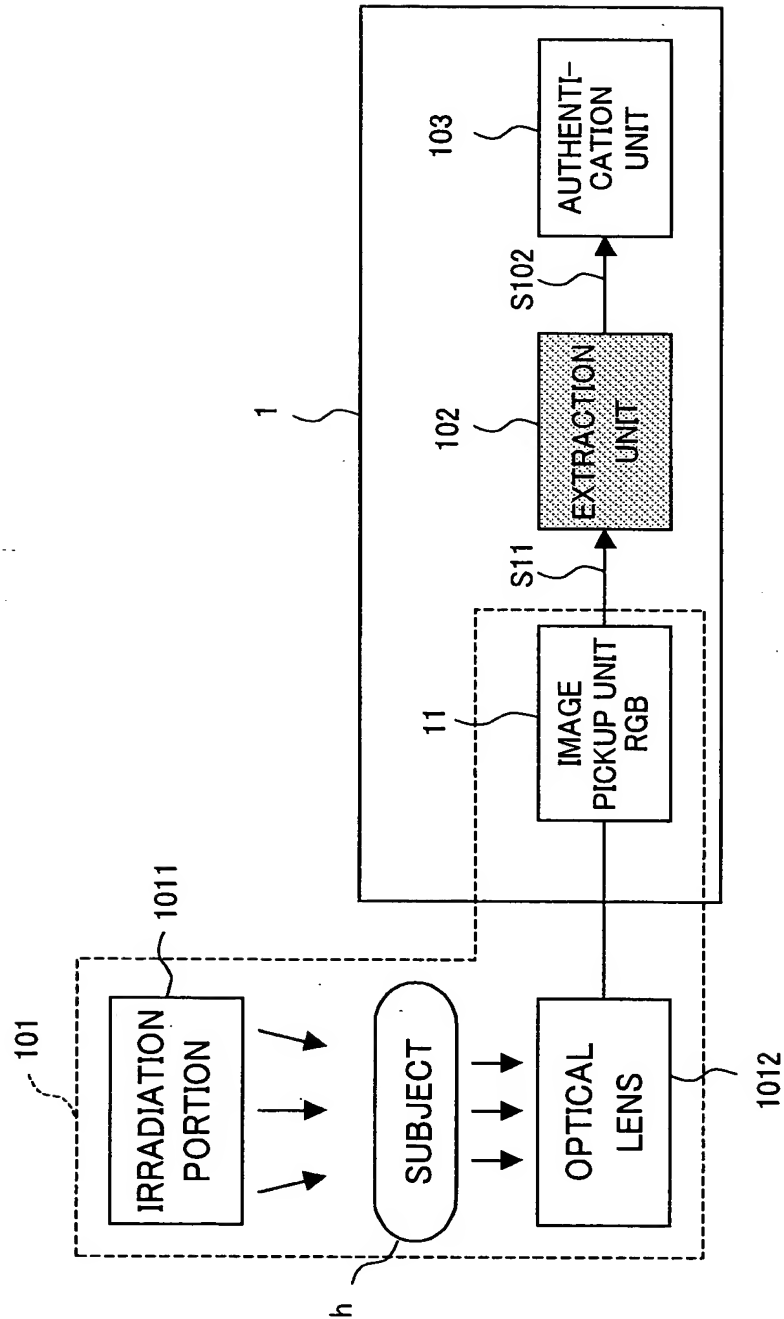


FIG. 2

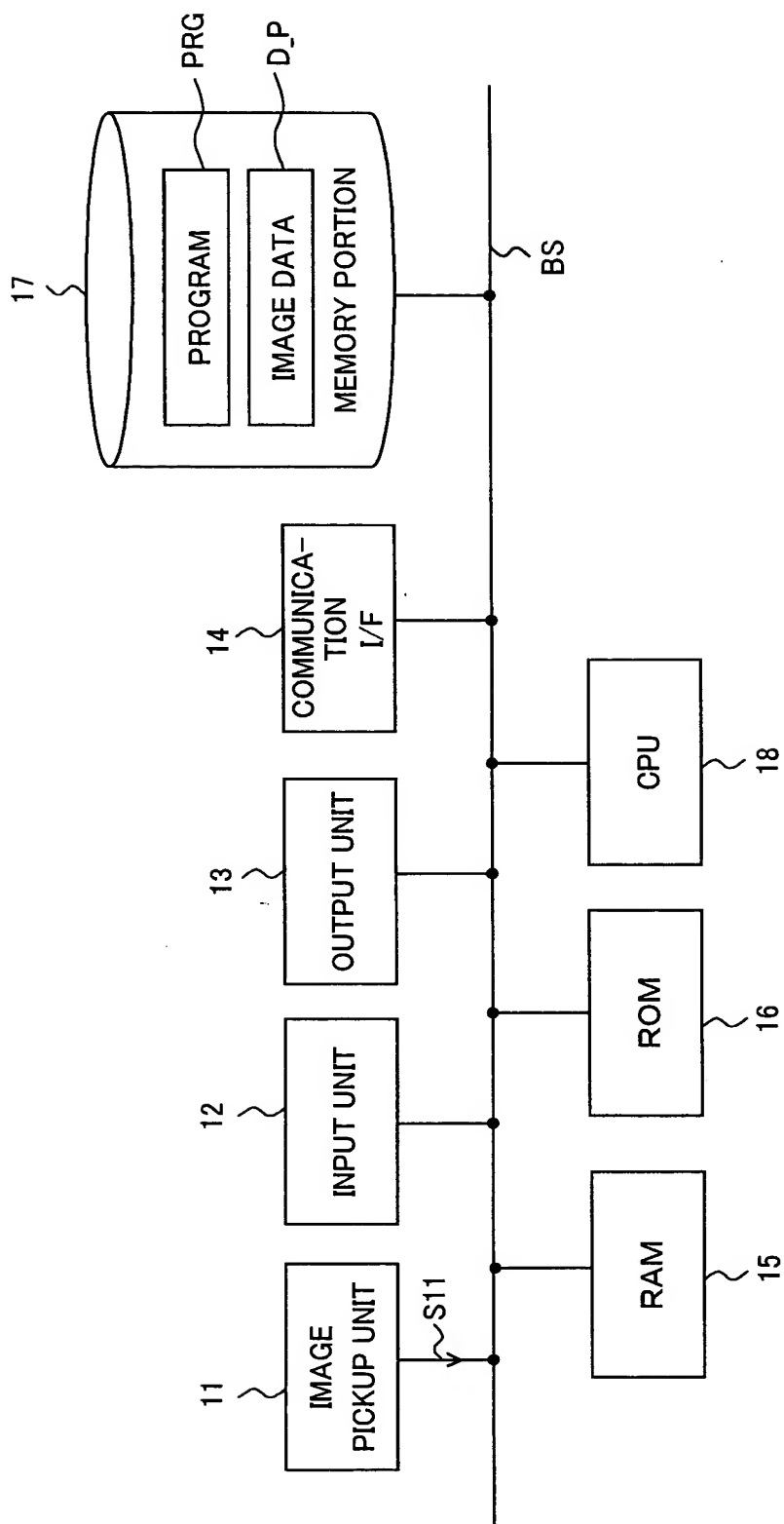


FIG. 3

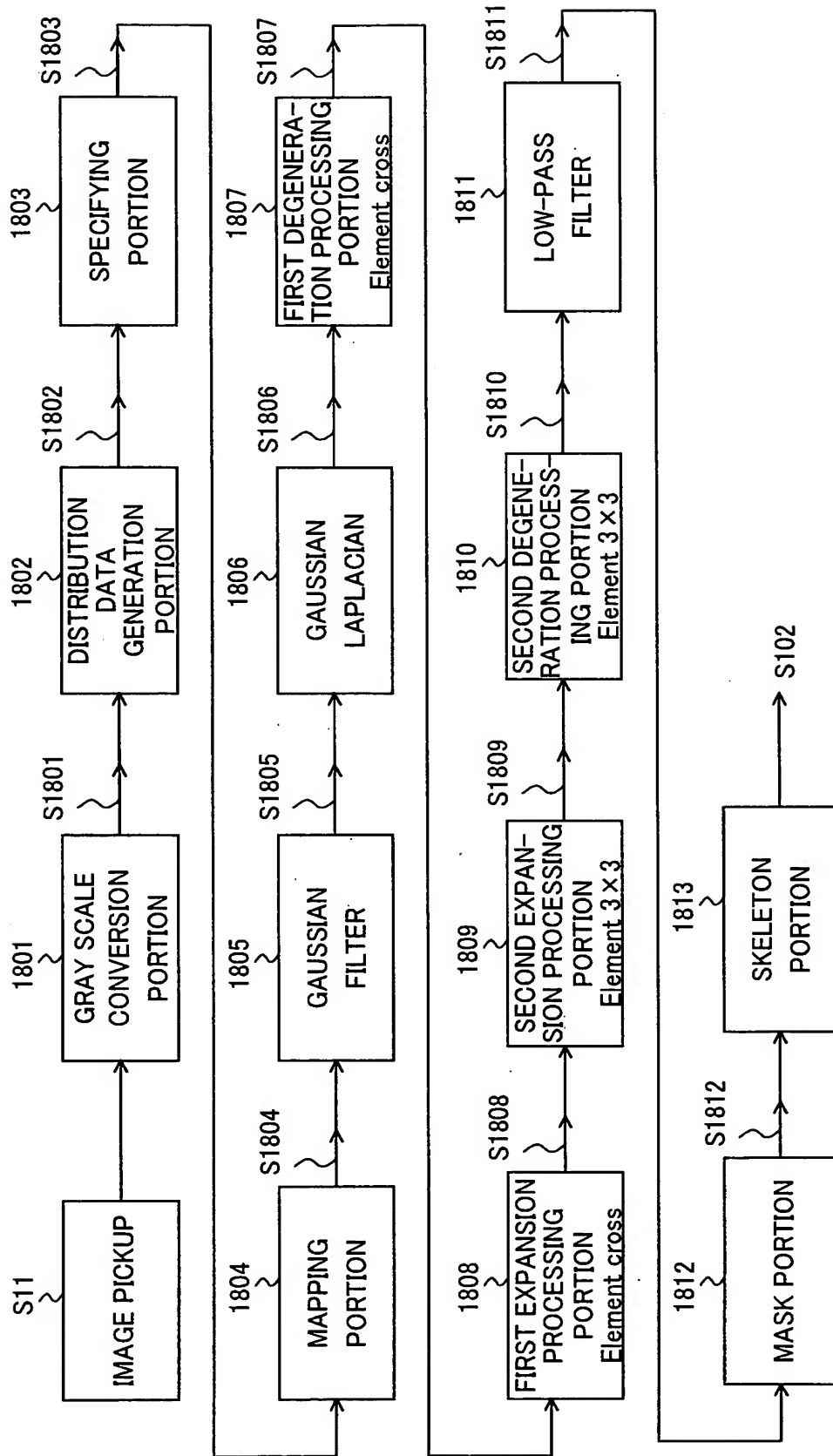


FIG. 4A

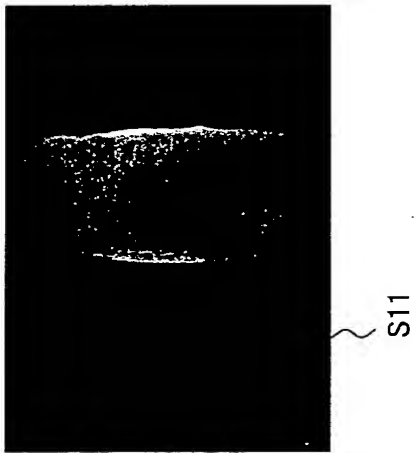


FIG. 4B

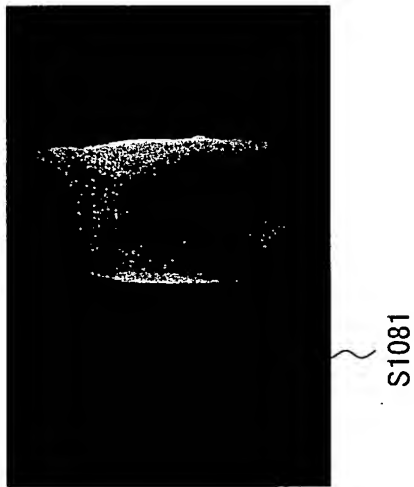


FIG. 4C

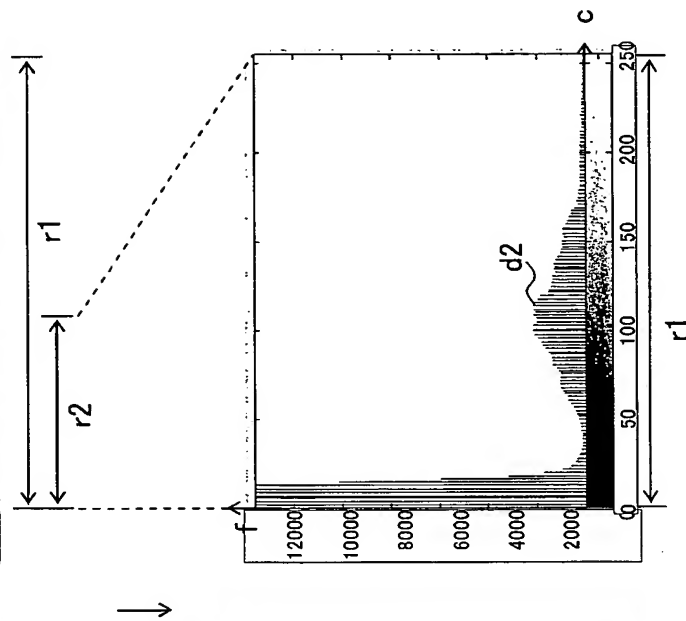
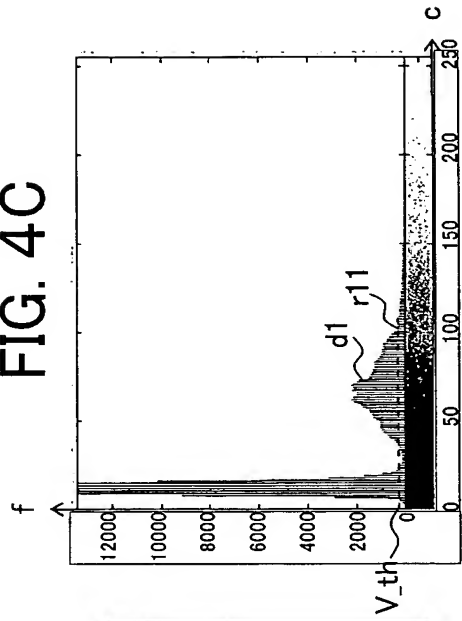


FIG. 4E

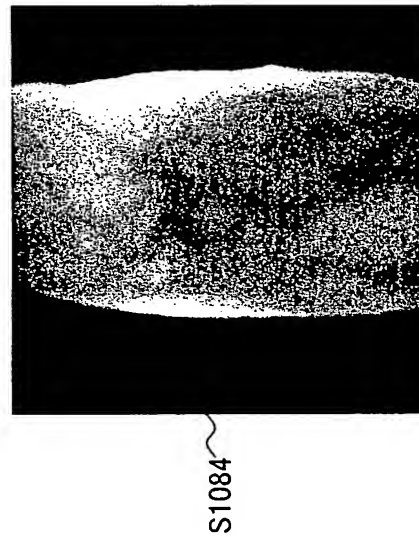


FIG. 4D

FIG. 5A

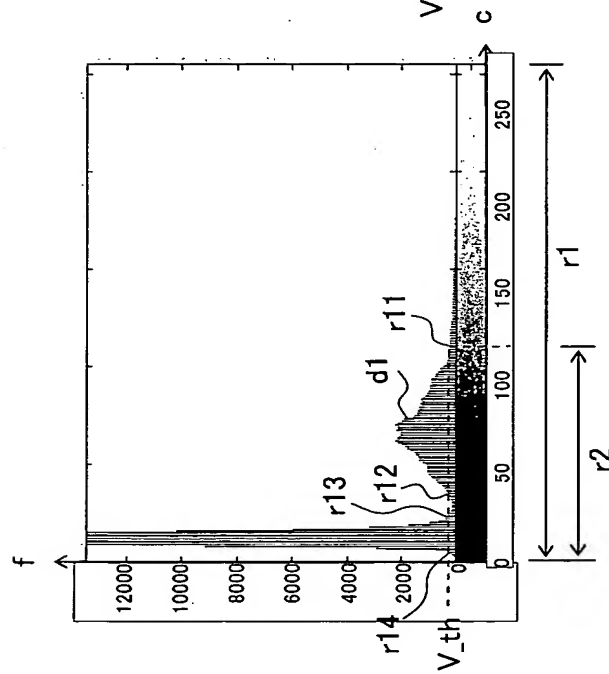


FIG. 5B

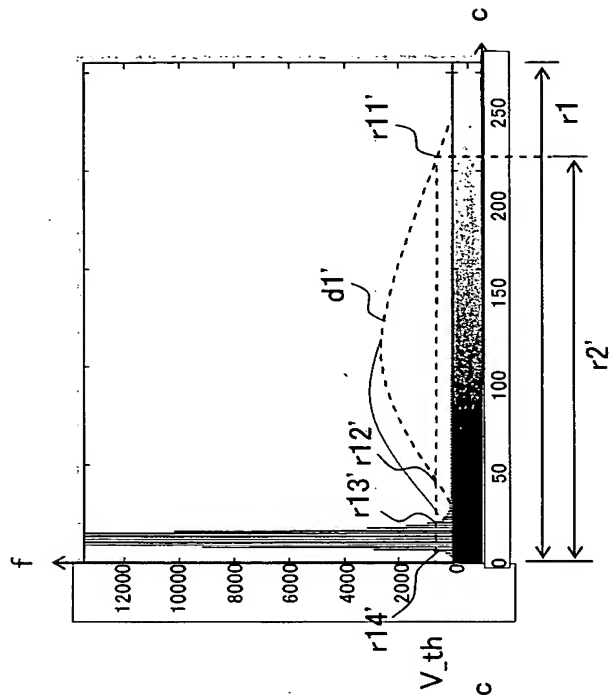


FIG. 6

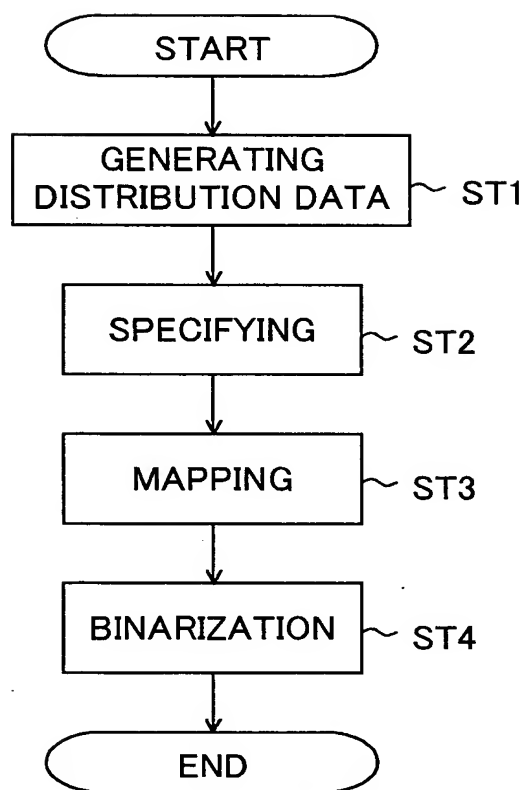


FIG. 7

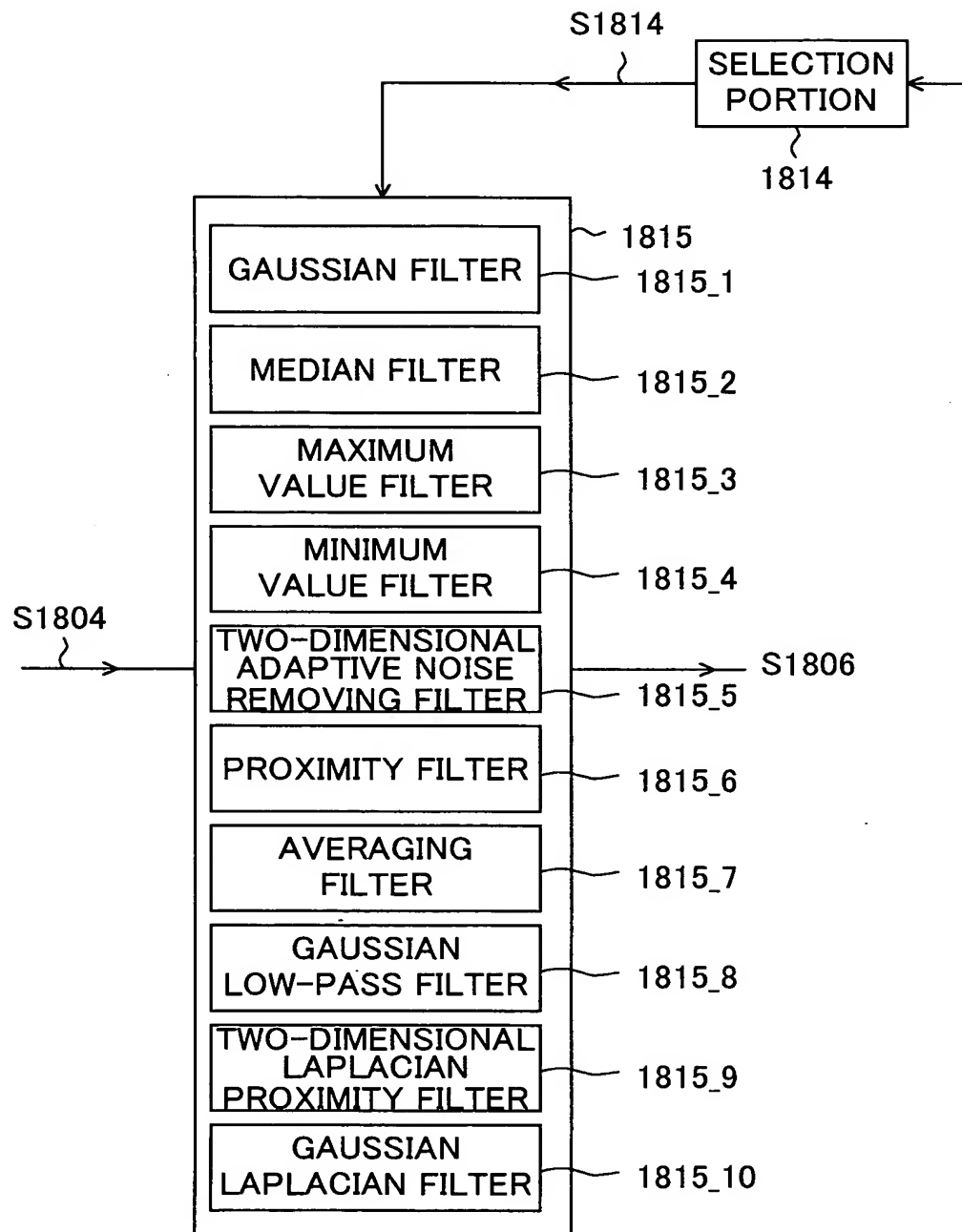


FIG. 8

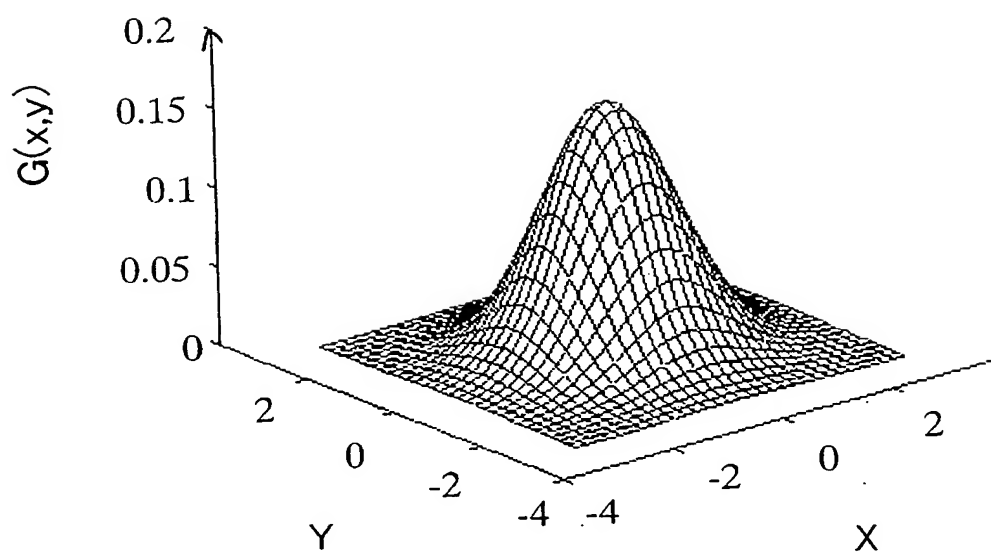


FIG. 9A

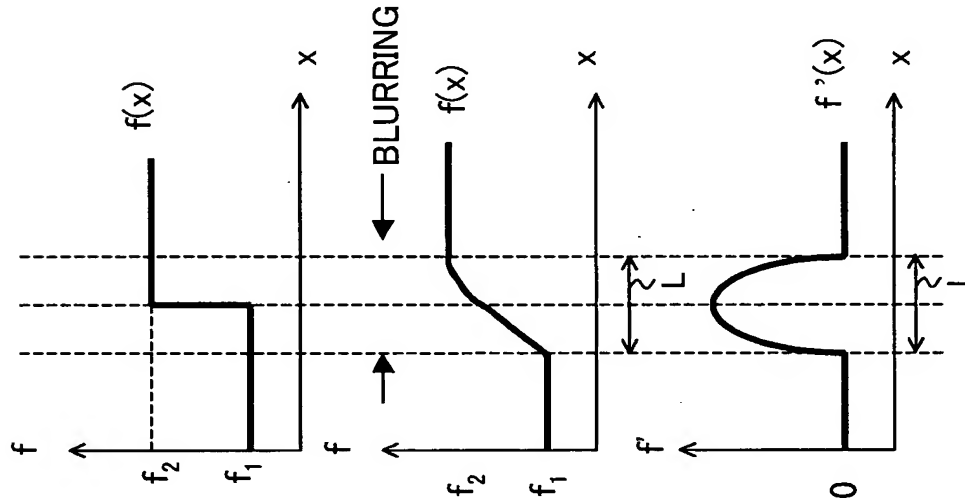


FIG. 9B

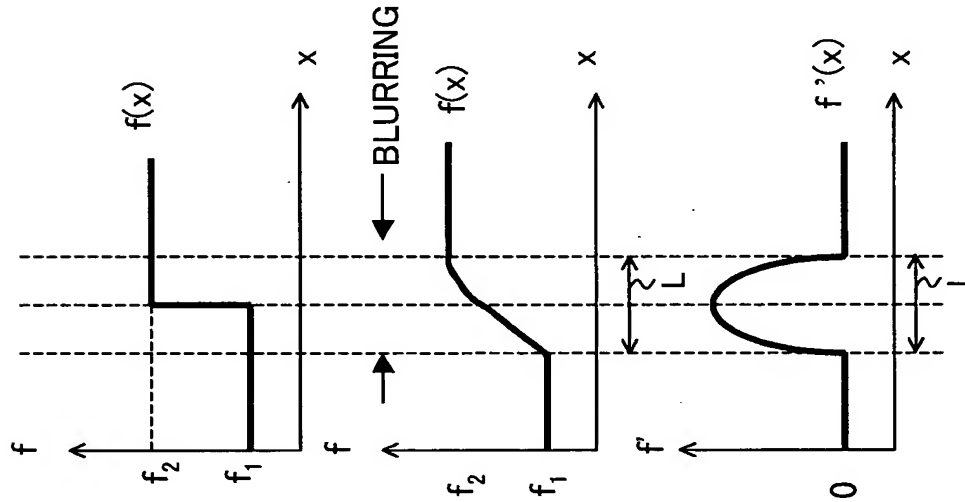
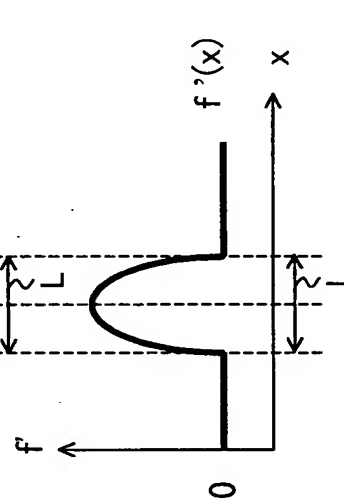


FIG. 9C



FIRST-ORDER DIFFERENTIAL

FIG. 9D

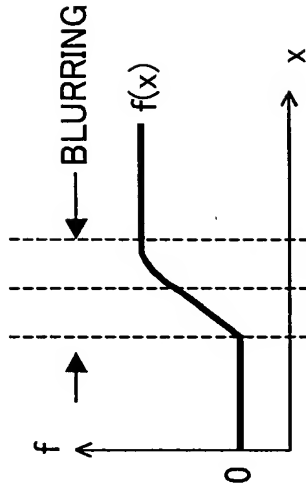


FIG. 9E

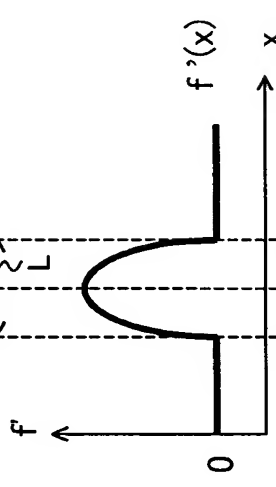
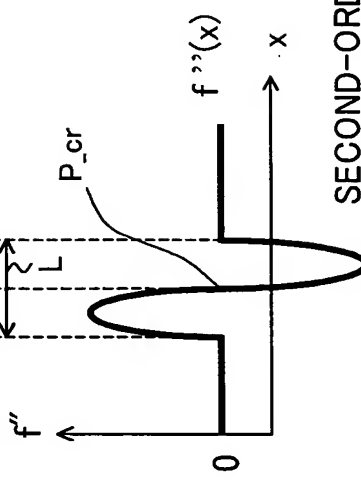


FIG. 9F



SECOND-ORDER DIFFERENTIAL

FIG. 10C

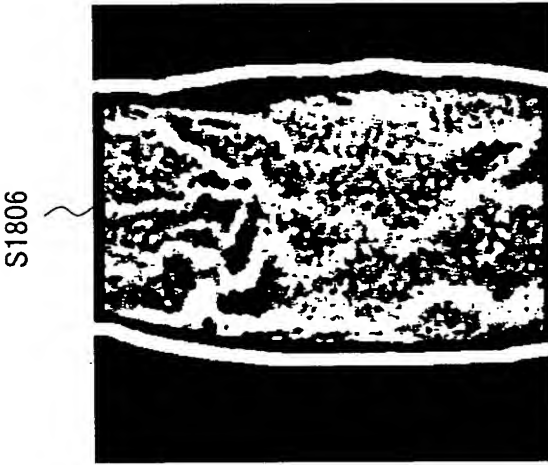


FIG. 11

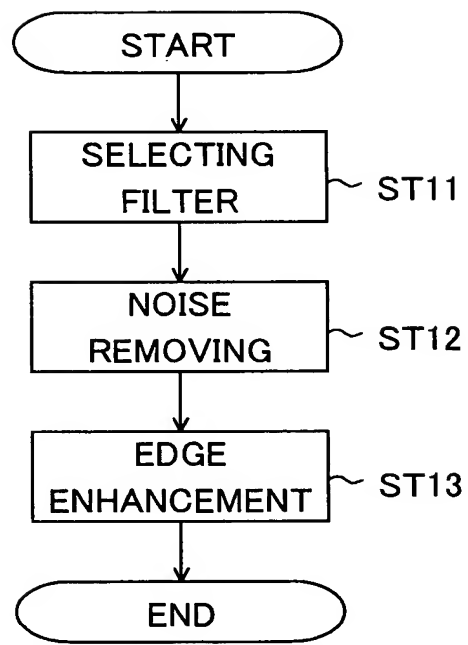


FIG. 12A

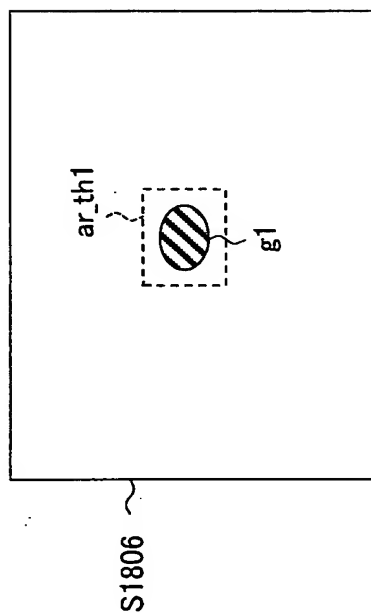


FIG. 12B

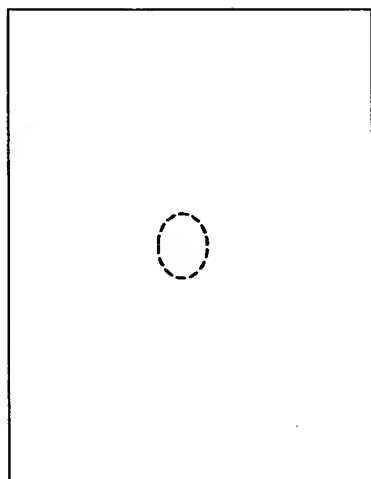


FIG. 12C

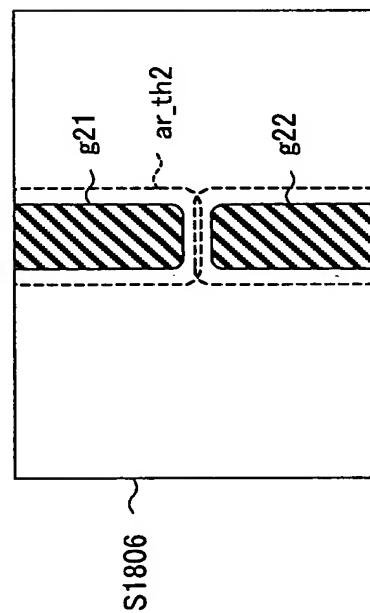
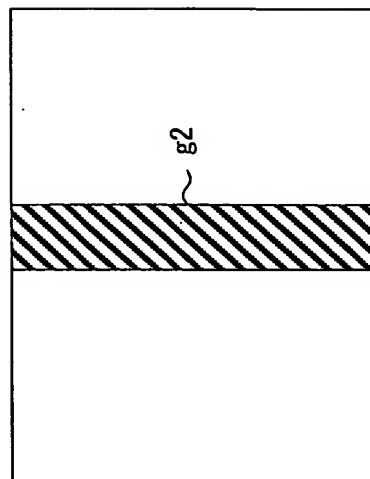


FIG. 12D



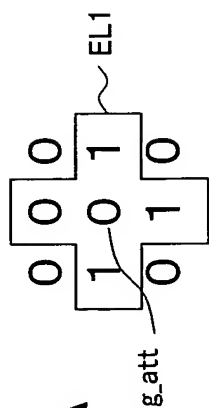


FIG. 13A

$\begin{matrix} & & g_att \\ & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ & 0 & 1 & 0 \end{matrix}$

FIG. 13B

$\begin{matrix} & & g_att \\ & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ & 0 & 1 & 0 \end{matrix}$

FIG. 13C

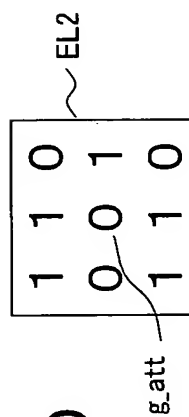


FIG. 13D

$\begin{matrix} & & g_att \\ & 1 & 1 & 0 \\ 0 & 0 & 1 & 0 \\ & 1 & 1 & 0 \end{matrix}$

FIG. 13E

$\begin{matrix} & & g_att \\ & 1 & 1 & 0 \\ 0 & 0 & 1 & 0 \\ & 1 & 1 & 0 \end{matrix}$

FIG. 13F

FIG. 14C

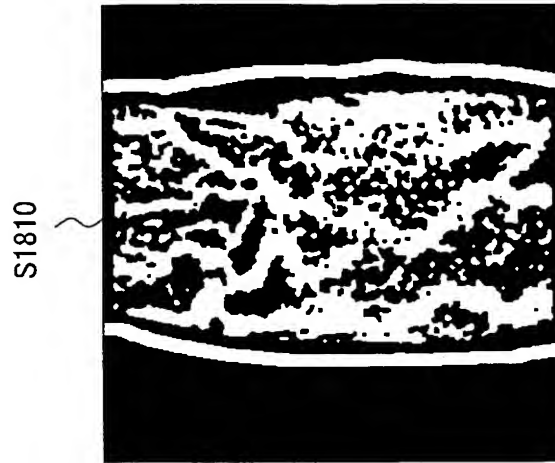


FIG. 14B

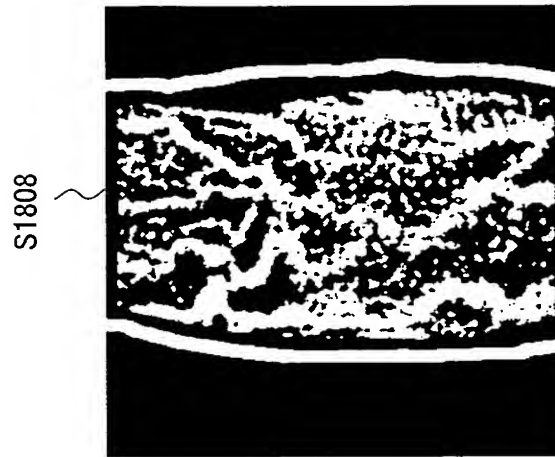
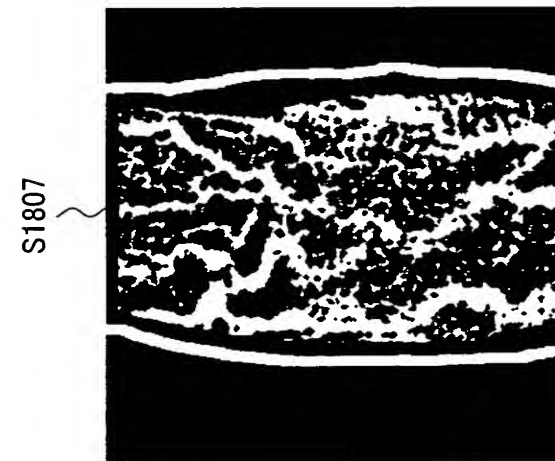


FIG. 14A



S1806

FIG. 15

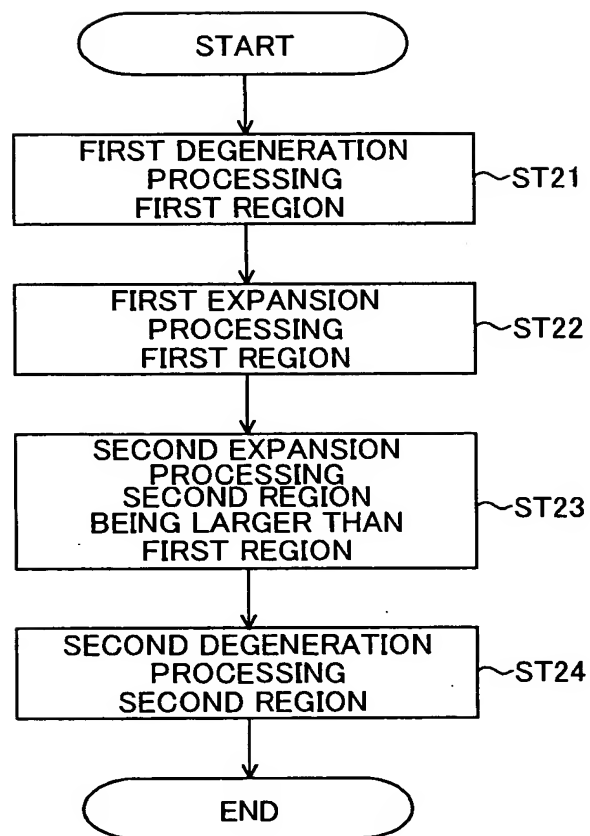


FIG. 16A

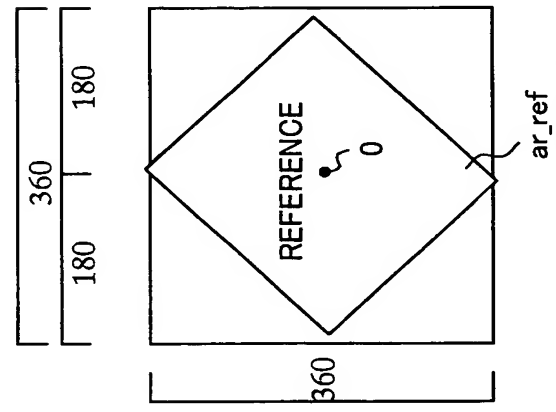


FIG. 16B

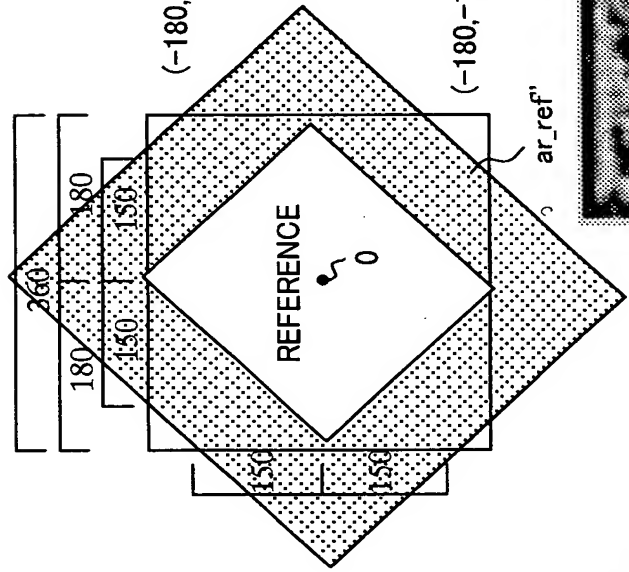


FIG. 16C

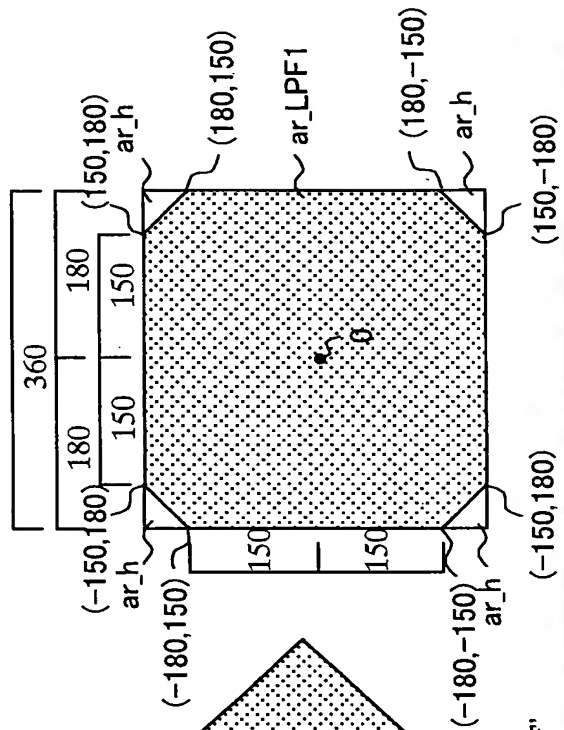


FIG. 16D

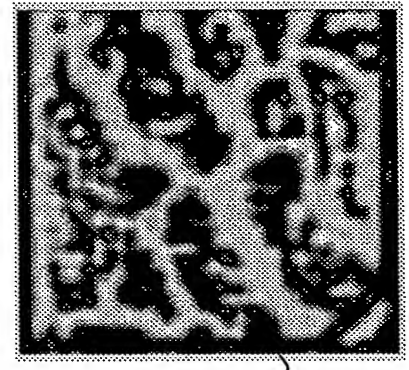


FIG. 16E

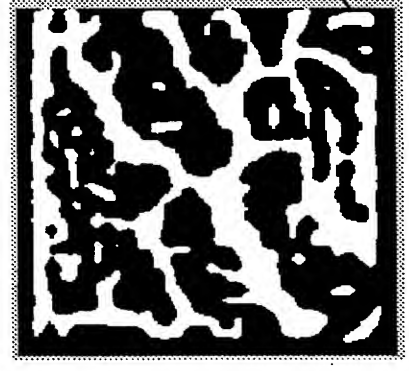


FIG. 16F

Th = 0.5

FIG. 17A

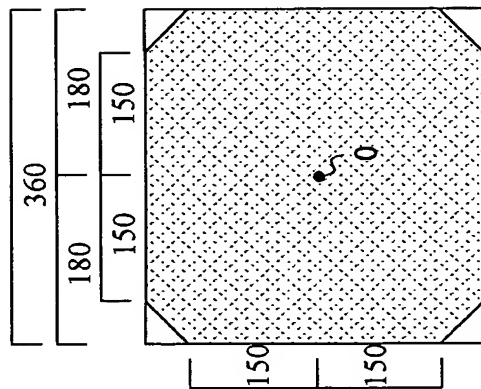
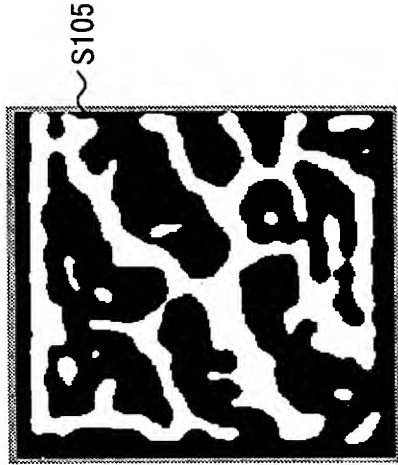
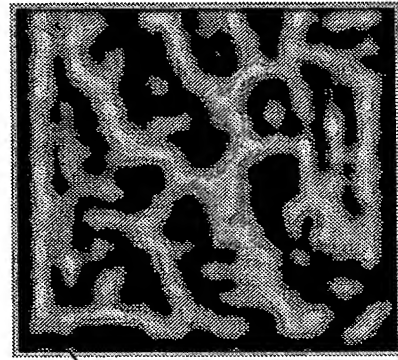
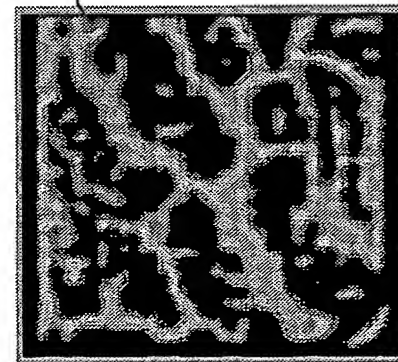
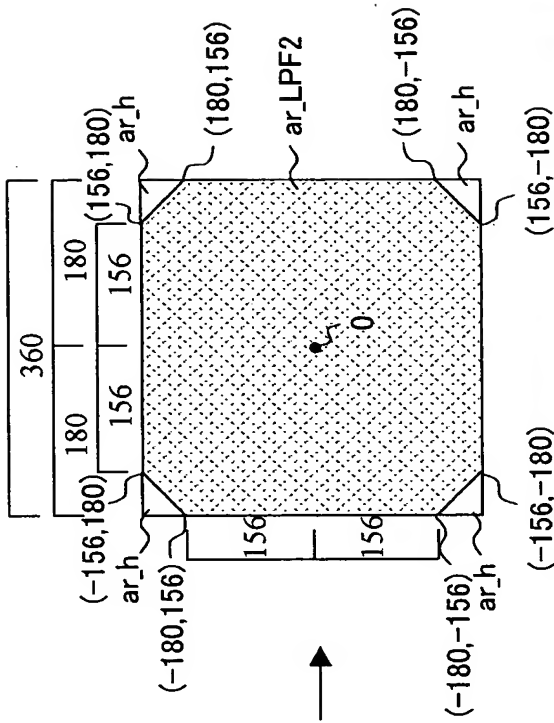


FIG. 17B



Th = 0.5

FIG. 17C

FIG. 17D

FIG. 17E

FIG. 18A

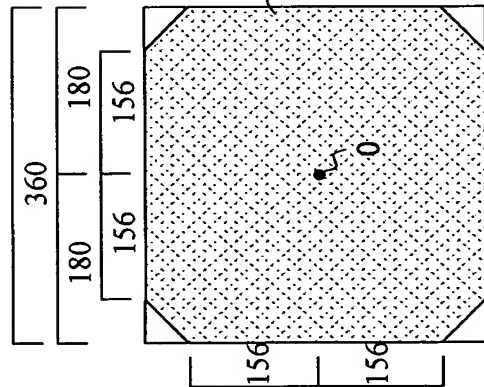


FIG. 18B

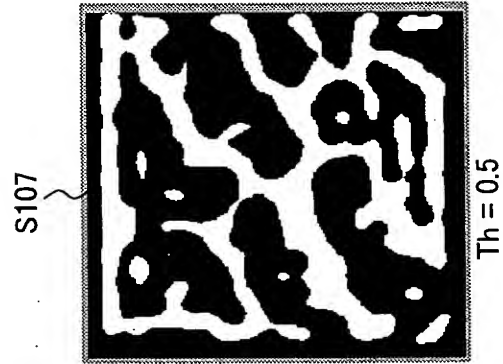
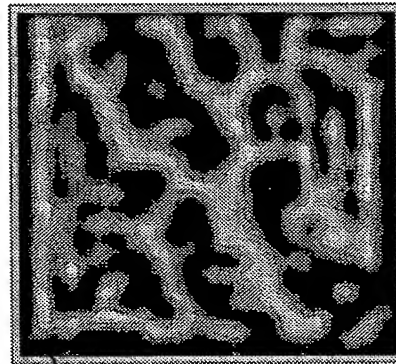
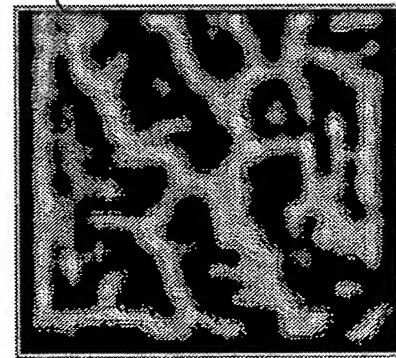
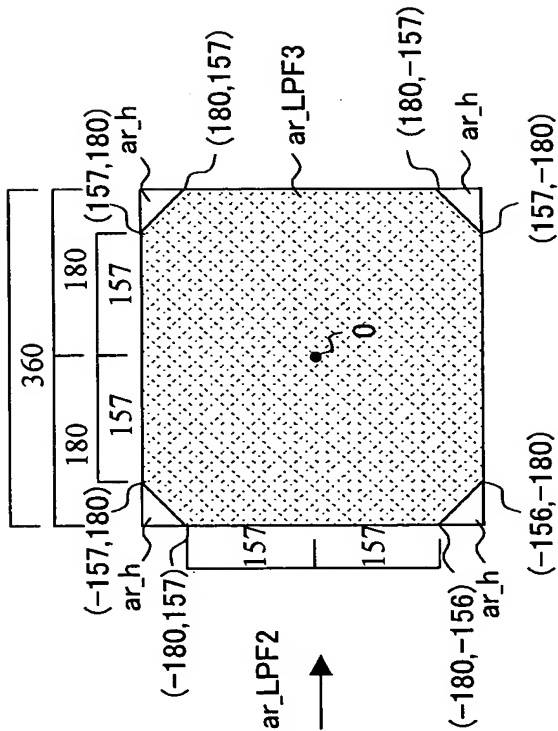


FIG. 18C

FIG. 18D

FIG. 18E

FIG. 19A

S1810

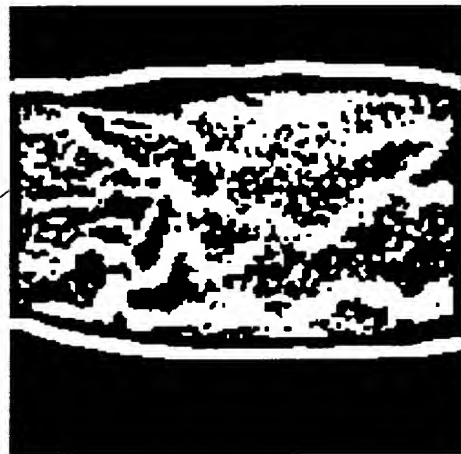


FIG. 19B

S18102

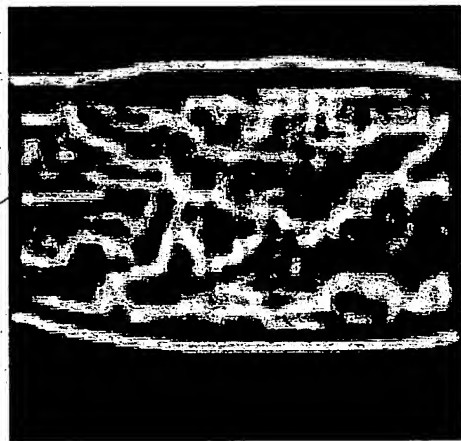
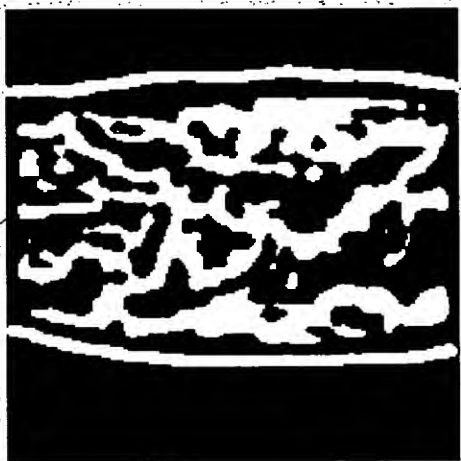


FIG. 19C

S18103



S18102

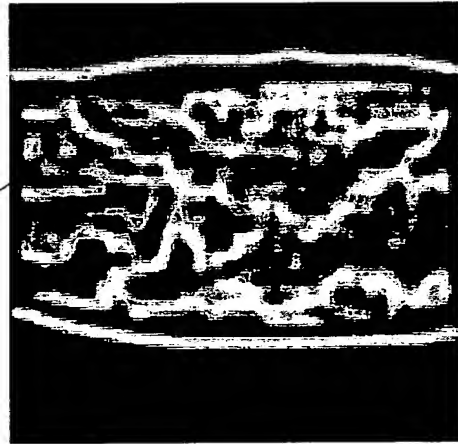


FIG. 19D

S18104

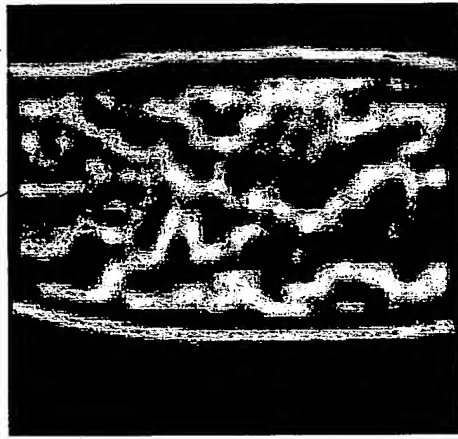


FIG. 19E

S18105

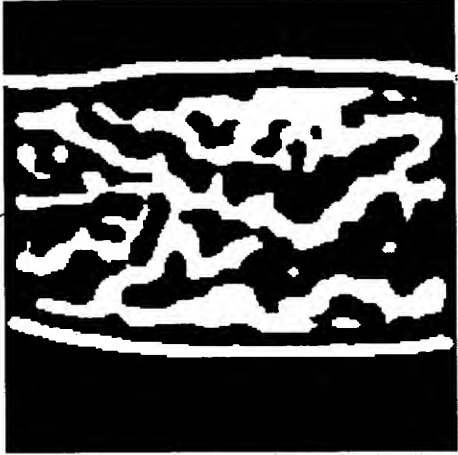


FIG. 19F

FIG. 20A

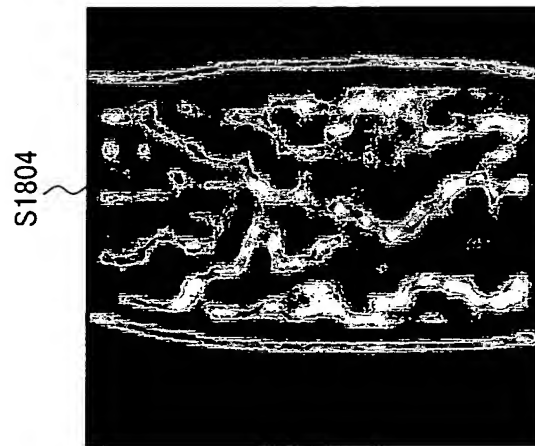


FIG. 20B

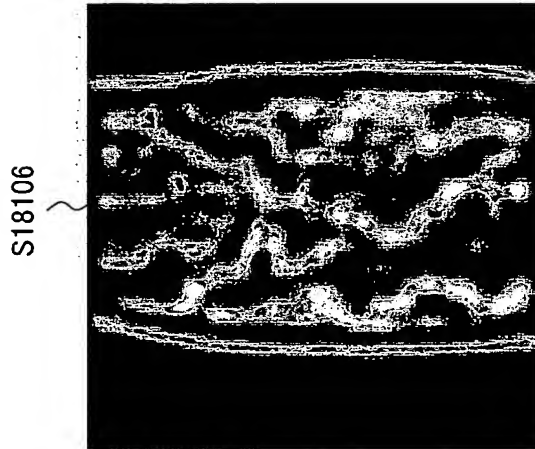


FIG. 20C

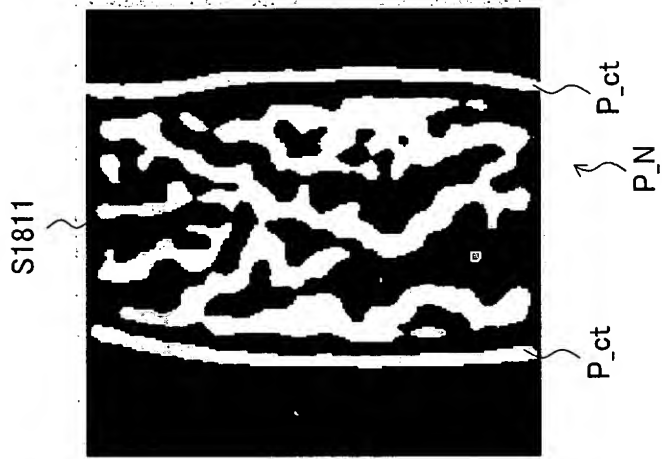


FIG. 21

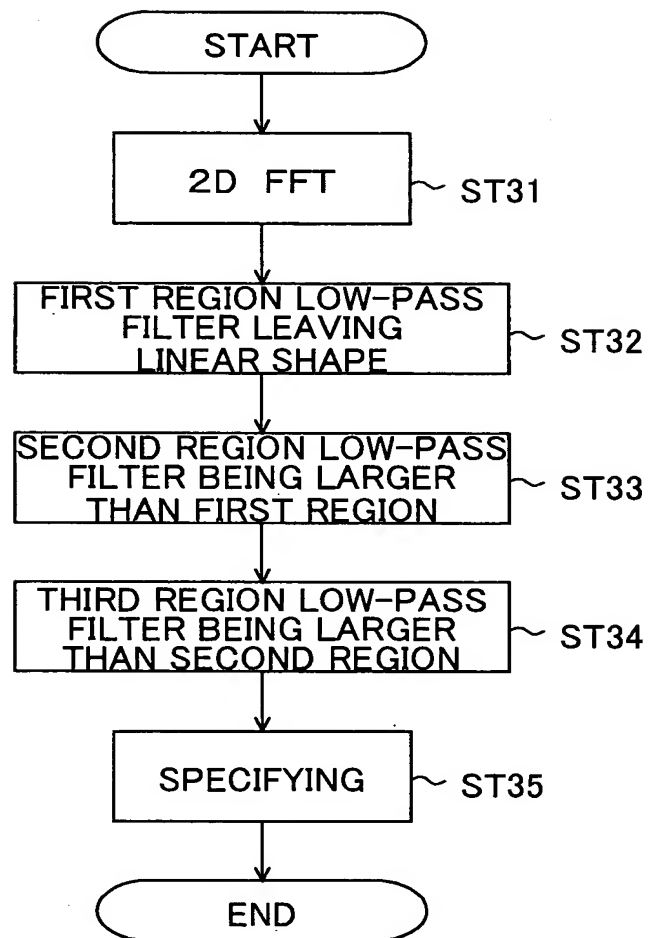


FIG. 22C

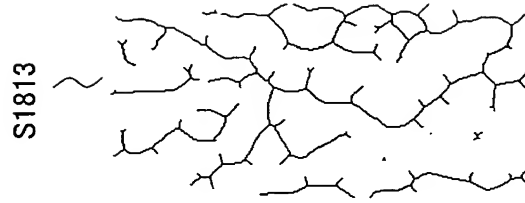


FIG. 22B

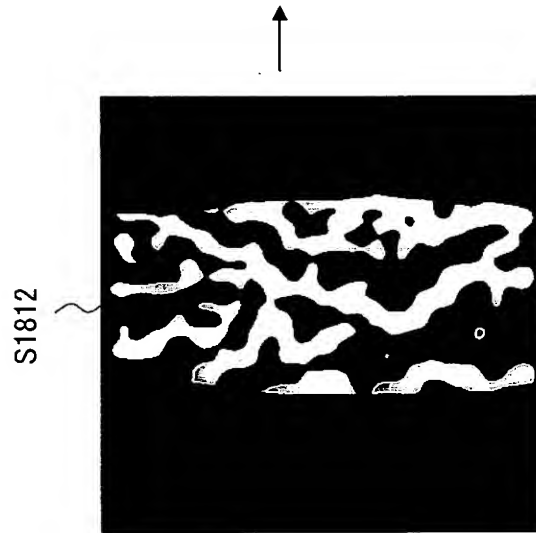


FIG. 22A

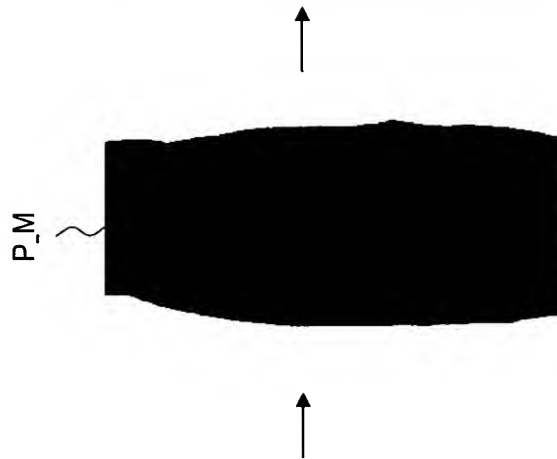


FIG. 23

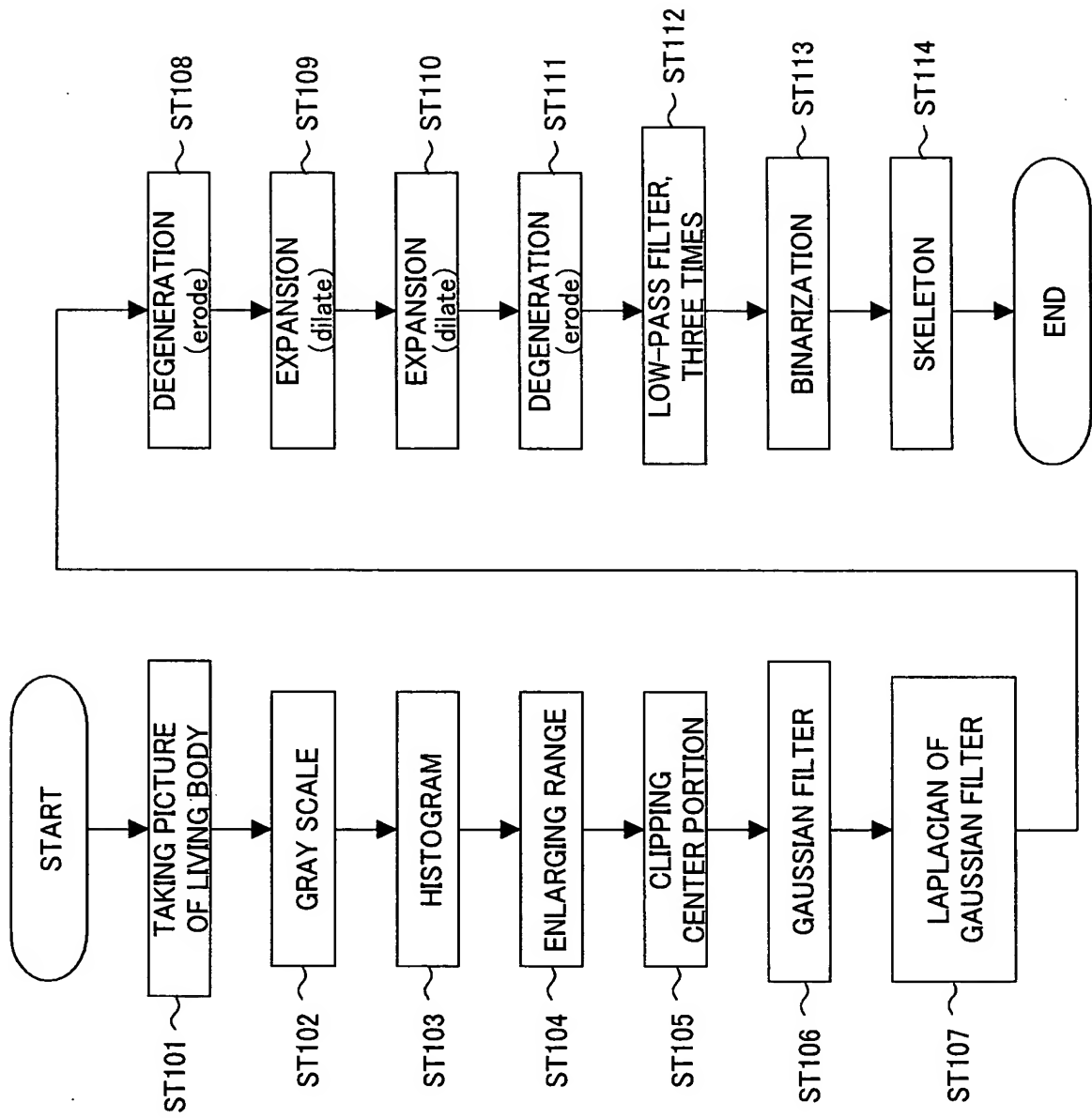


FIG. 24

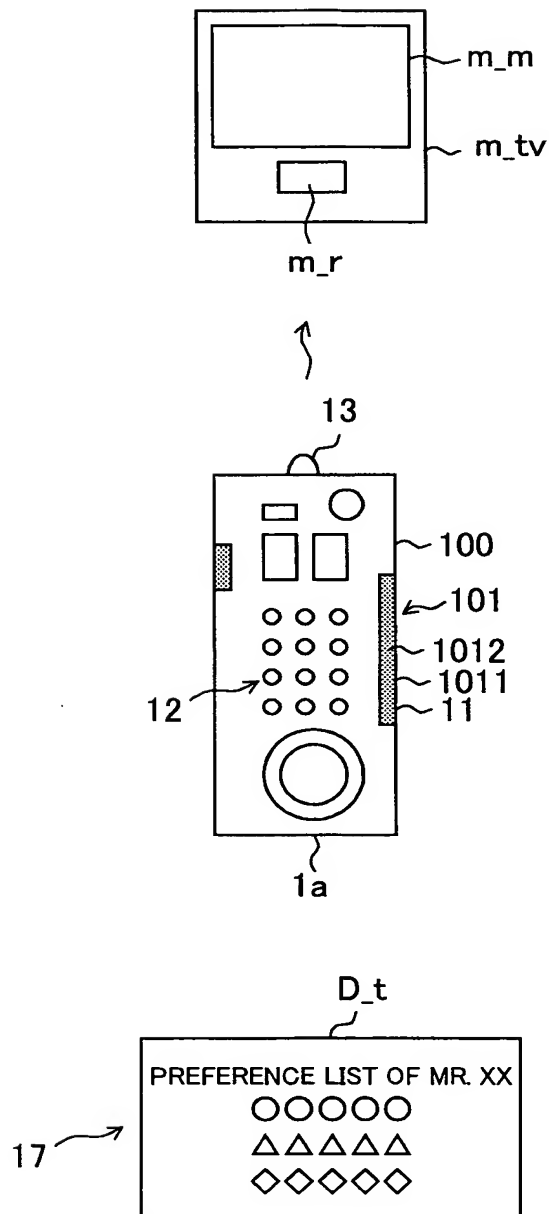


FIG. 25

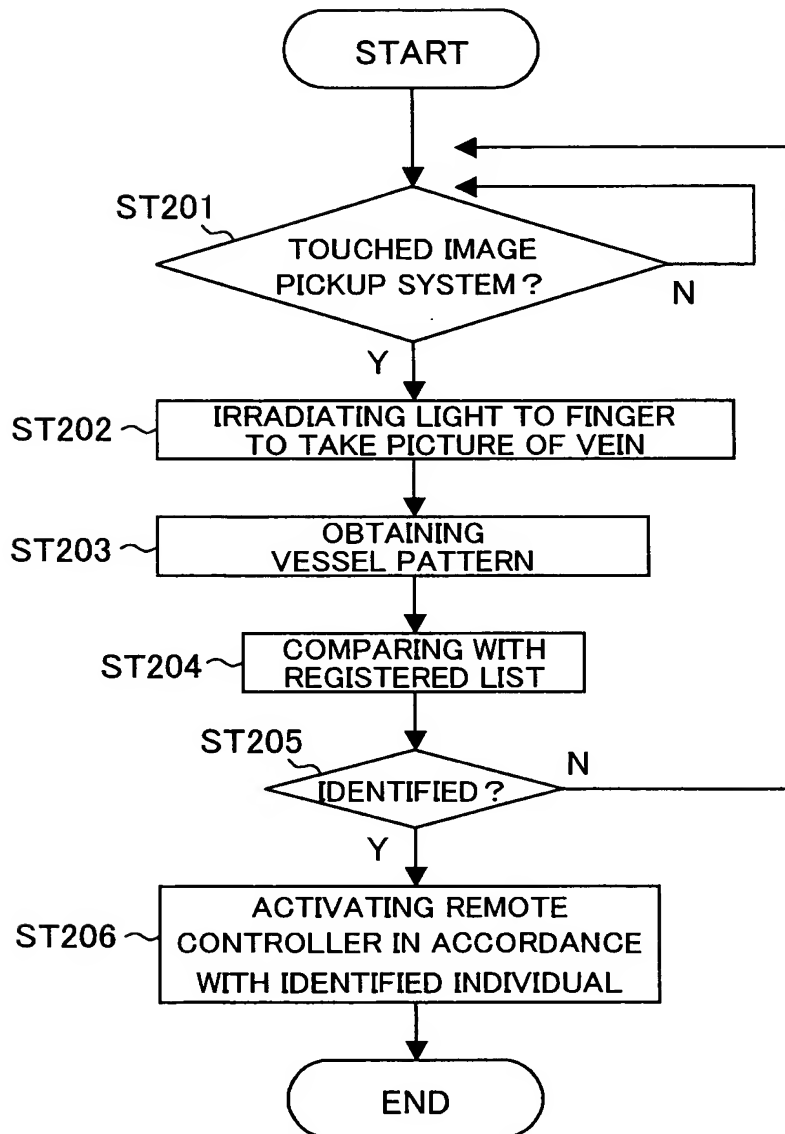


FIG. 26

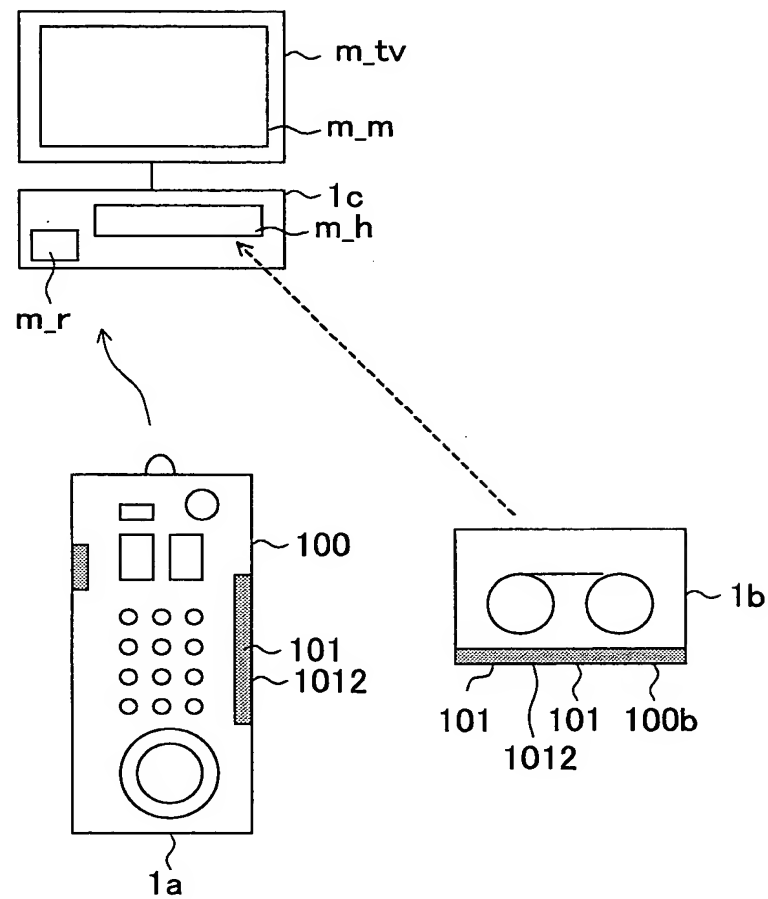
10b

FIG. 27

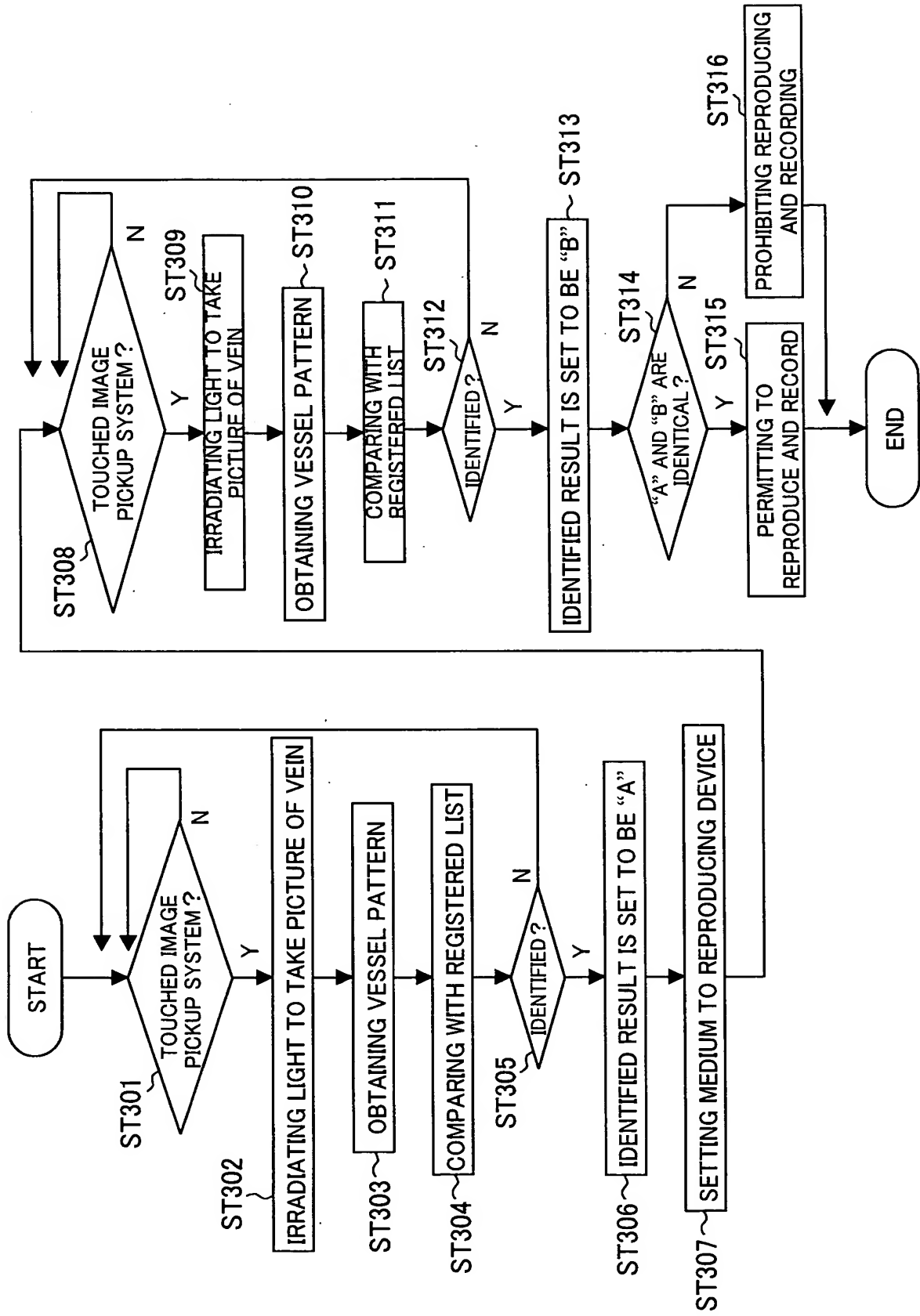


FIG. 28

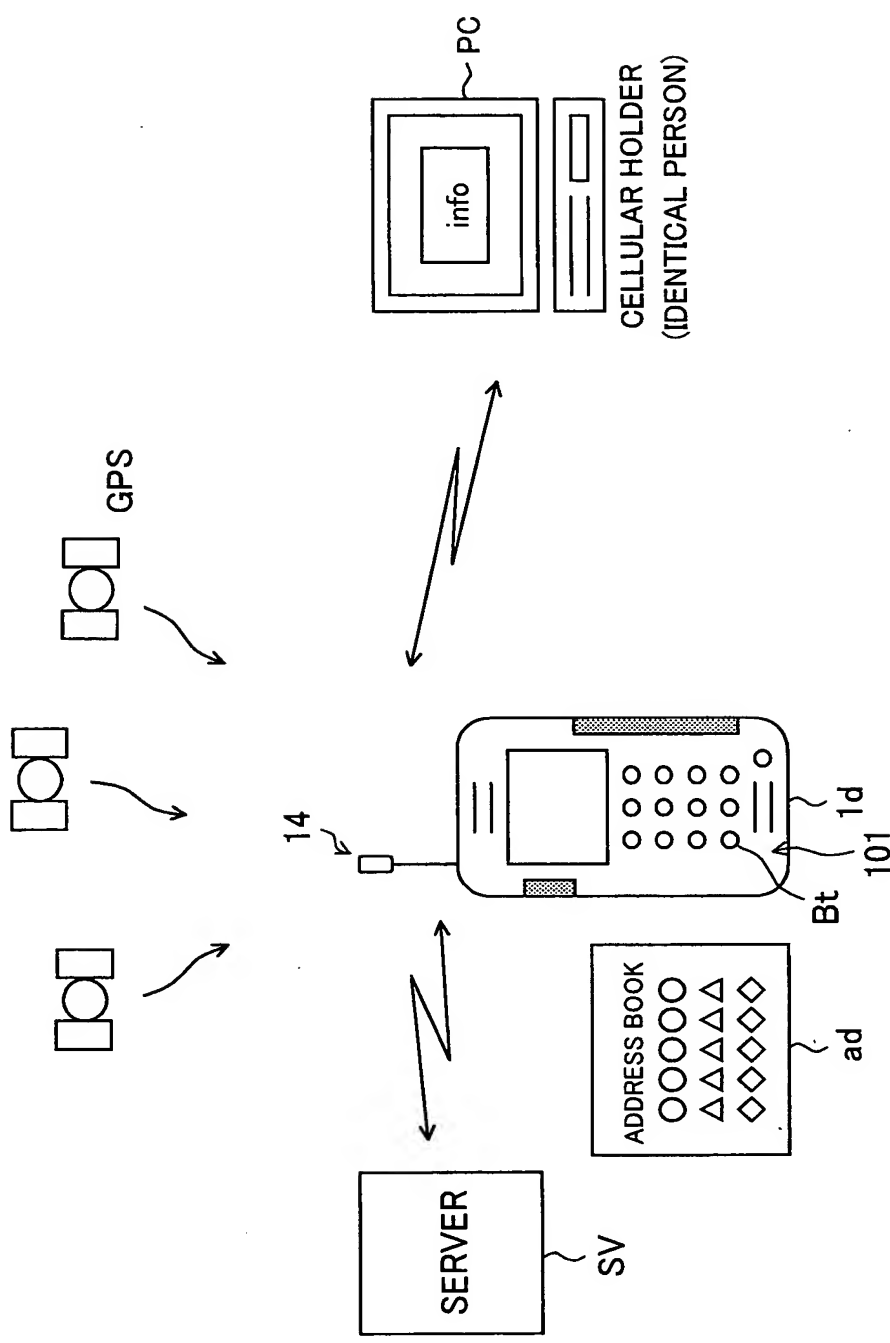


FIG. 29

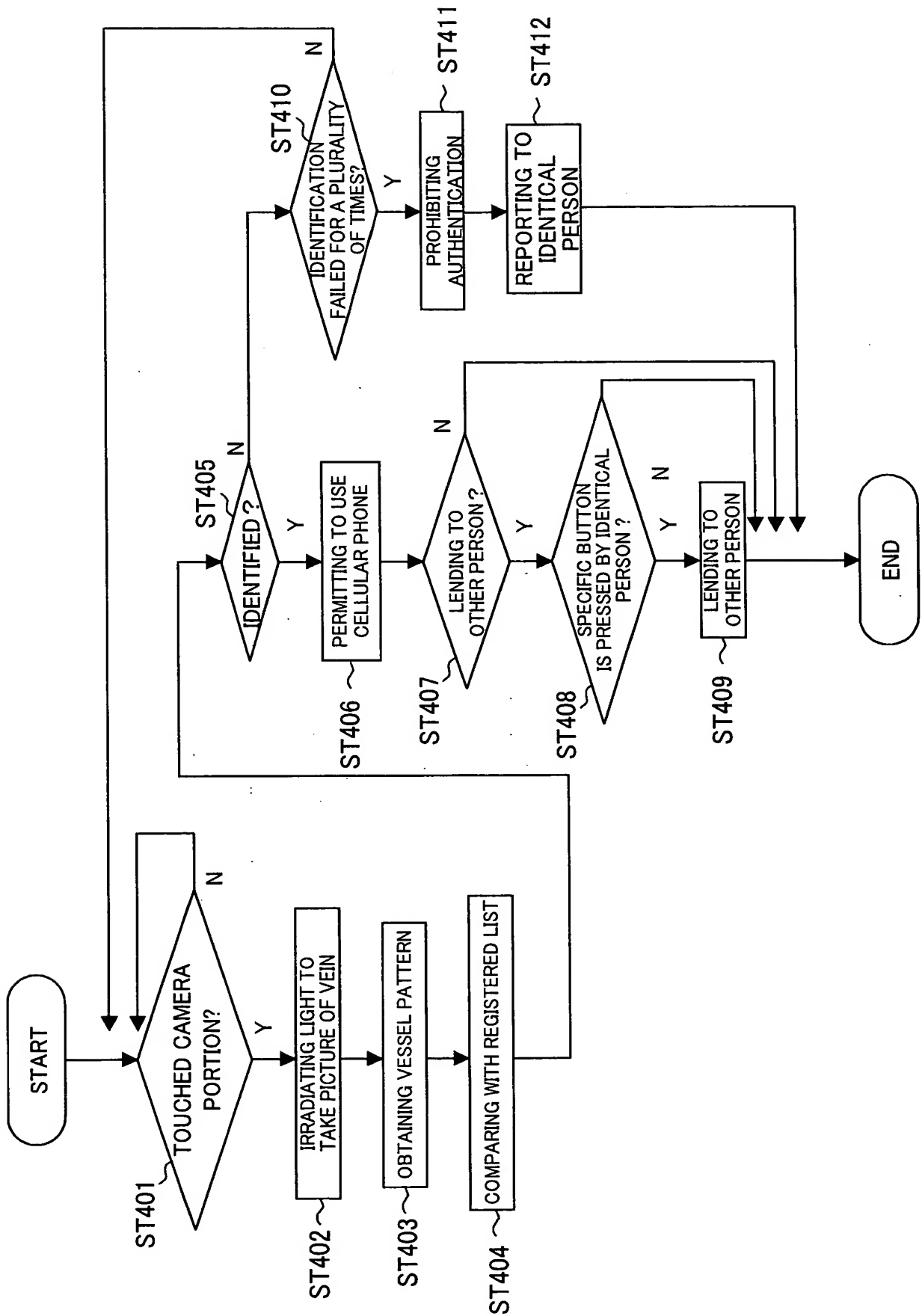


FIG. 30

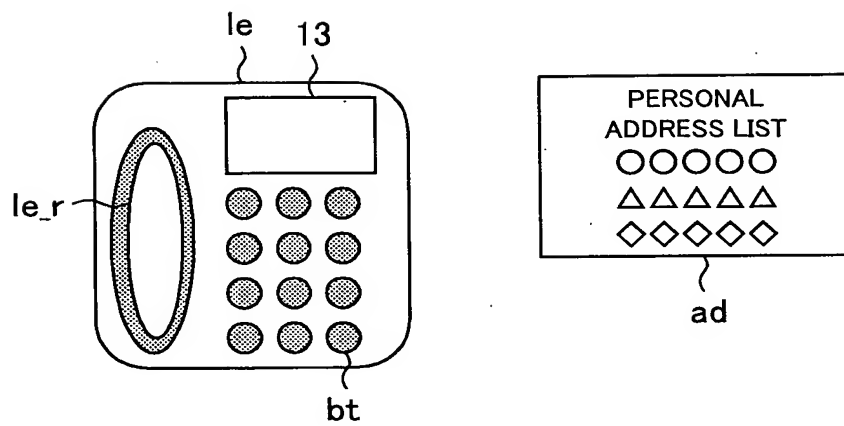


FIG. 31

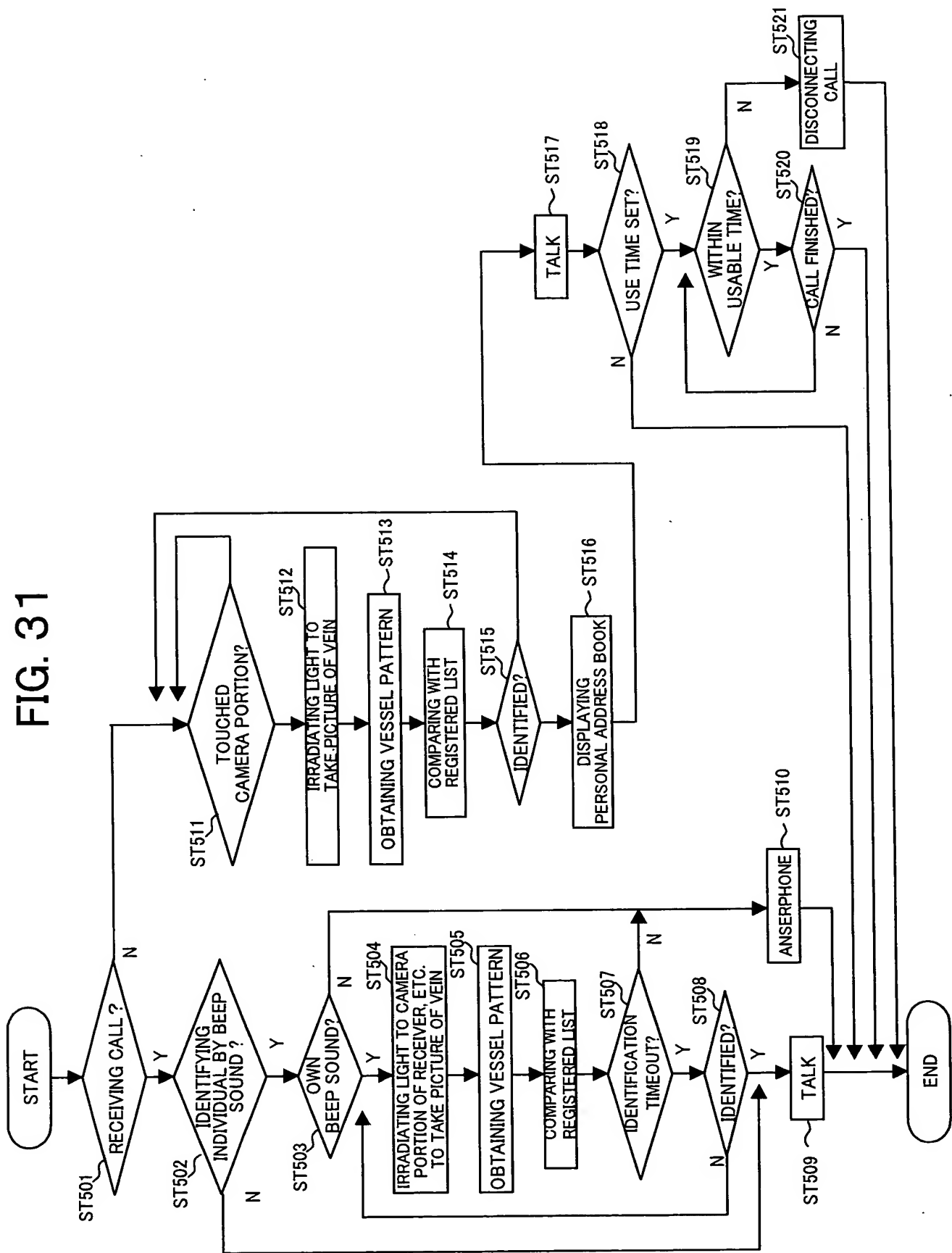


FIG. 32

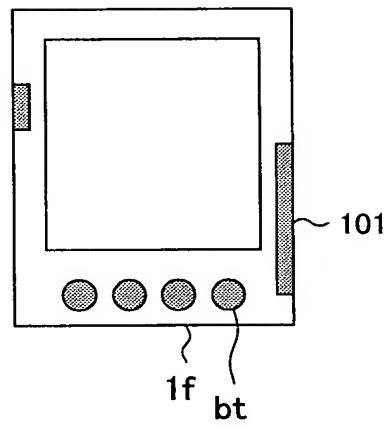
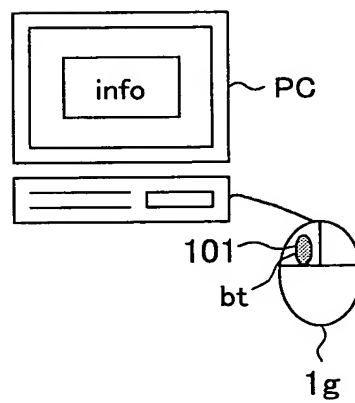


FIG. 33



Explanation of References

- 1... data processing apparatus
- 2... image pickup unit
- 5 12... input unit
- 13... output unit
- 14... communication interface
- 15... RAM (random access memory)
- 16... ROM (read only memory)
- 10 17... memory unit
- 18... CPU
- 101... image pickup system
- 102... extracting unit
- 103... authentication unit
- 15 1011... irradiation portion
- 1012... optical lens
- 1801... gray scale conversion portion
- 1802... distribution data generation portion
- 1803... specifying portion
- 20 1804... mapping portion
- 1805... Gaussian filter
- 1806... Gaussian Laplacian
- 1807... first degeneration processing portion
- 1808... first expansion processing portion
- 25 1809... second expansion processing portion

- 1810... second degeneration processing portion
- 1811... low-pass filter portion
- 1812... mask portion
- 1813... skeleton portion
- 5 1814... selection portion
- 1815... noise removing filter
- 1815_1... Gaussian filter
- 1815_2... median filter
- 1815_3... maximum value filter
- 10 1815_4... minimum value filter
- 1815_5... two-dimensional adaptive noise removing filter
- 1815_6... proximity filter
- 1815_7... averaging filter
- 1815_8... Gaussian low-pass filter
- 15 1815_9... two-dimensional Laplacian proximity filter
- 1815_10... Ga